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Grand Challenges in Global Mental Health
Online Supplementary Materials

SUPPLEMENTARY METHODS

The Modified Delphi Method

The Grand Challenges in Global Mental Health initiative employed a modified three-round Delphi method to identify and build consensus among a panel of stakeholders about the barriers to reducing neuropsychiatric disorders on a global scale. The Delphi method involves asking experts in a Delphi panel to anonymously provide structured sequential input in response to priority-setting questions presented across multiple rounds. After each round, participants may revise their responses in light of the larger group's responses. The goal is the convergence of the group toward consensus.

Selection of panel members occurred via nomination by the SAB, and was supplemented with targeted snowball sampling to ensure geographic and disciplinary representativeness. Panel nomination and snowball sampling occurred between March 24, 2010 and April 18, 2010. Following nomination, prospective panel members were emailed a concept note (Supplementary Notes) with information about the initiative, including definitions, goals, and methods, and were invited formally to participate. The final Delphi panel consisted of 422 researchers, academics, advocates, clinicians, and NGO staff, representing a variety of disciplines and regions of the world (Supplementary Figures 1-3). The final Delphi panel was 35% female.

In this initiative, the working definition of *mental health* included all conditions that affect the nervous system and are leading causes of disease burden: depression, anxiety disorders, schizophrenia, bipolar disorders, alcohol and drug use disorders, mental disorders of childhood, migraines, dementias, and epilepsy—collectively identified as mental, neurological and substance use (MNS) disorders The term *global* mental health was defined to encompass mental health in any country of the world, as well as global influences on mental health more broadly.

Round 1 took place between April 19, 2010 and July 12, 2010. Data entry, coding of Round 1 responses with ATLAS.ti (version 6.1.17, GmbH, Berlin) occurred between July 13, 2010 and September 29, 2010. Round 2 took place between September 30, 2010 and November 18, 2010.

The leadership team, comprising members of the EC and SAB who could attend, and the AT, convened on December 20 and 21 in Bethesda, Maryland to discuss the top challenges, goals (Table 2 in print version), and priorities. Members of the EC and SAB refined the wording and presentation of the GCGMH Delphi panel's selections from Round 2 and grouped them according to six goals. Four challenges that were selected among the top 40 in Round 2 were combined into two distinct challenges. Challenges 3 and 7, "Integrate core packages of mental health services into routine primary health care" and "Conduct screening for mental, neurological and substance use disorders during routine primary health care visits" were merged into "Integrate screening and core packages of services for MNS disorders into routine primary health care". Similarly, challenges 20 and 21, "Redesign health systems to integrate MNS disorders with other chronic disease care" and "Create parity between mental and physical illness in research, training, treatment, and prevention investments" were merged and edited to create "Redesign health systems to integrate MNS disorders with other chronic disease care, and create parity between mental and physical illness in research, training, treatment, and prevention investments." Table 2 in the print version presents illustrative, but not exhaustive, examples of research

questions that the EC and SAB formulated to address the challenges and goals. The order in which the challenges are presented in Table 2 of the print version does not denote relative importance.

In Round 3, which occurred between November 22, 2010 and February 10, 2011, panelists were asked to rank the top 40 challenges, along a four-point scale (High=3, Moderate=2, Low=1, None=0), across four criteria. These criteria developed by the SAB were based on those employed in the Child Health Nutrition Research Initiative. Each of the criteria was defined and qualified as follows:

- **Disease burden reduction**: To what extent would addressing this challenge reduce the burden of mental, neurological, and substance use disorders?
- **Disparity reduction**: To what extent would addressing this challenge reduce disparities in (i.e. have an equalizing effect of) the disease burden of or access to care for mental, neurological, and substance use disorders?
- **Immediacy of impact**: To what extent would addressing this challenge produce immediate changes in the disease burden of or access to care for mental, neurological, and substance use disorders?
- **Feasibility**: To what extent is it practical/feasible to address this challenge?

SUPPLEMENTARY DISCUSSION

Top 40 Challenges: A Comparison of Selections by Basic Scientists and the Overall Group

Given the predominance of epidemiologists, clinical, and health services researchers on the panel, we examined the priorities of basic science researchers in relation to the overall group (Supplementary Table 2). The top 40 challenges selected by basic scientists (i.e. participants whose primary disciplines pertained to basic behavioral science, genetics/genomics, neurobiology/neuroscience, or neurodevelopment and environmental influences—36% of the sample) in Round 2 were nearly identical with the overall group. Both groups prioritized the same top challenge, "Develop an evidence-based set of primary prevention interventions for a wide range of mental, neurological and substance use disorders." The top 12 challenges were the same among the overall panel and the basic scientist panel members, albeit with varied priority rankings.

Eight (20%) of the top 40 challenges prioritized by the overall panel were not prioritized by the basic scientist panel members. Those challenges, denoted in red text in Supplementary Table 2, include challenges that address the following: assessment of MNS disorders; development of family-oriented prevention strategies; integration of mental health into international development; involvement of those with MNS disorders in policy and practice; improvement of access to evidence-based treatments; and integration of MNS disorders into the chronic disease agenda. Basic scientists' priorities replacing these challenges, denoted in green in Supplementary Table 2, included the following: promotion of an integrated view of neuroscience; identification of true disease endophenotypes; understanding of human brain development; application of genomics to the study of MNS disorders; development of rapid action drugs; determination of neural mechanisms of MNS disorders; promotion of awareness of modifiable risk factors; and promotion of awareness of the burdens of and treatments for.

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AUTHOR CONTRIBUTIONS

Pamela Y. Collins, Vikram Patel, Sarah S. Joestl, Dana March, Thomas R. Insel, and Abdallah S. Daar are co-chairs of the Scientific Advisory Board (PYC and VP), members of the Administrative Team (SJ and DM) and co-chairs of the Executive Committee (TRI and AD); they contributed substantially to the conceptualization and implementation of the project and to the writing of the manuscript. Collins and Daar conceptualized the project; Collins, Patel, and Daar and Insel were responsible for the scientific oversight and integrity of the project. Collins, Joestl and March conducted the daily operations of the initiative at NIMH; Joestl and March managed the data entry and analysis, supervised by Collins and Patel; Insel and Daar reviewed results. Insel and Collins co-chaired the leadership meeting of the Executive Committee and Scientific Advisory Board in Bethesda. Collins, Joestl and March compiled the first draft of the manuscript, and Collins led the revision of various drafts of the manuscript, coordinated all correspondence with co-authors, and managed the master version of the paper. Patel, Joestl, March, Insel and Daar contributed substantially to revision of the manuscript. Daar and Insel were the correspondents with Nature and negotiated terms with them.

The following authors are members of the Grand Challenges in Global Mental Health Executive Committee (EC) who reviewed and commented on the manuscript: Warwick Anderson, *National Health and Medical Research Council, Australia*; Muhammad A. Dhansay, *Medical Research Council, South Africa*; Anthony Phillips, *Canadian Institutes of Health Research, Canada*; Susan Shurin, *National Heart,*

Lung, and Blood Institute, USA; and Mark Walport, *Wellcome Trust, UK*. Wendy Ewart, *Medical Research Council, UK*, represented EC member Sir John Savill, *Medical Research Council, UK* and reviewed the manuscript.

The following authors are members of the Grand Challenges in Global Mental Health Scientific Advisory Board (SAB) who attended the leadership meeting and/or provided comments and revisions to the manuscript: Isabel A. Bordin, *Federal University of São Paulo, Brazil*; E. Jane Costello, *Duke University, USA*; Maureen Durkin, *University of Wisconsin School of Medicine and Public Health, USA*; Christopher Fairburn, *Oxford University, UK*; Roger I. Glass, *Fogarty International Center, USA*; Wayne Hall, *University of Queensland, Australia*; Yueqin Huang*, Institute of Mental Health of Peking University and National Center for Mental Health of the Chinese Center for Disease Control and Prevention, China*; Steven E. Hyman, *Harvard University, USA*; Kay Jamison, *Johns Hopkins University, USA*; Sylvia Kaaya, *Muhimbili University of Health and Allied Sciences, Tanzania*; Shitij Kapur, *Kings College London, UK*; Arthur Kleinman, *Harvard University, USA*; Adesola Ogunniyi, *University of Ibadan, Nigeria*; Angel Otero-Ojeda, *Cayetano Heredia University, Peru*; Mu-Ming Poo, *University of California, Berkeley, USA*; Vijayalakshmi Ravindranath, *Indian Institute of Science, India*; Barbara J. Sahakian, *University of Cambridge, UK*; Shekhar Saxena, *World Health Organization, Switzerland*; Peter A. Singer, *McLaughlin-Rotman Centre for Global Health, Canada*; and Dan J. Stein, *University of Cape Town, South Africa*.

AUTHOR INFORMATION

Reprints and permissions information is available at www.nature.com/reprints. The authors declare the following financial interests: Dr. Kapur has received grant support from AstraZeneca, Bristol-Meyers Squibb, and GlaxoSmithKline; he has served as a consultant/scientific advisor and/or participant in speaking engagements supported by AstraZeneca, Bioline, Bristol-Myers Squibb, Eli Lilly, Janssen (Johnson & Johnson), Lundbeck, NeuroSearch, Otsuka, Pfizer, Roche, Servier and Solvay Wyeth.

Dr. Phillips serves as a Director on the board of Allon Therapeutics, Inc. and holds shares in this company.

Dr. Sahakian consults for Cambridge Cognition and has consulted for Novartis, Shire, GlaxoSmithKline, Lilly, Boehringer-Ingelheim and Hoffman-La Roche. She holds a grant funded by Johnson & Johnson and has received honoraria for Grand Rounds in Psychiatry at Massachusetts General Hospital (CME credits) (Boston, 27 April 2007) and for speaking at the International Conference on Cognitive Dysfunction in Schizophrenia and Mood Disorders: Clinical Aspects, Mechanisms and Therapy (Brescia, 17019 January 2007). She was on the Medical Research Council Neurosciences and Mental Health Board (2010) and on the Science Coordination Team for the Foresight Project on Mental Capital and Wellbeing, 2008 (Office of Science, The Department of Innovation, Universities and Skills). She is currently on Panel LS5 for the European Research Council. As an Associate Editor, she receives an honorarium from the Journal of Psychological Medicine.

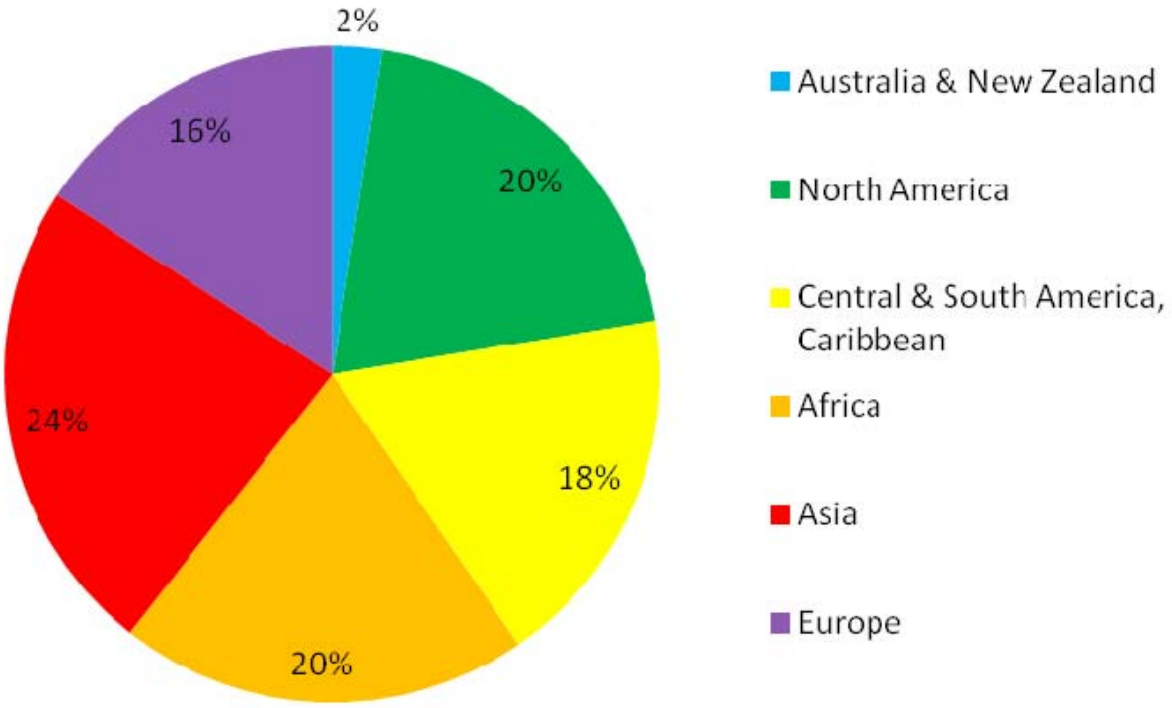
Dr. Singer is CEO of Grand Challenges Canada, a funding organization that may launch requests for proposals on this topic.

Dr. Stein has received research grants and/or consultancy honoraria from AstraZeneca, Eli Lilly, GlaxoSmithKline, Johnson & Johnson, Lundbeck, Orion, Pfizer, Pharmacia, Roche, Servier, Solvay, Sumitomo, Tikvah and Wyeth.

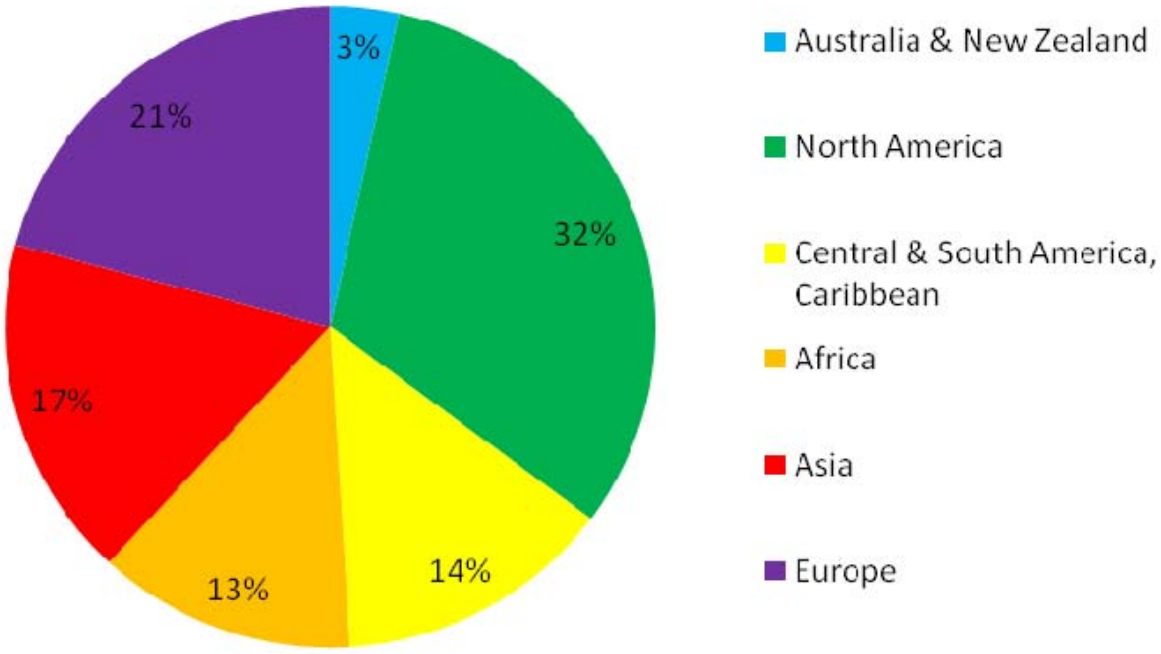
Correspondence and requests for material should be addressed to Pamela Y. Collins (pamela.collins@nih.gov).

SUPPLEMENTARY FIGURES

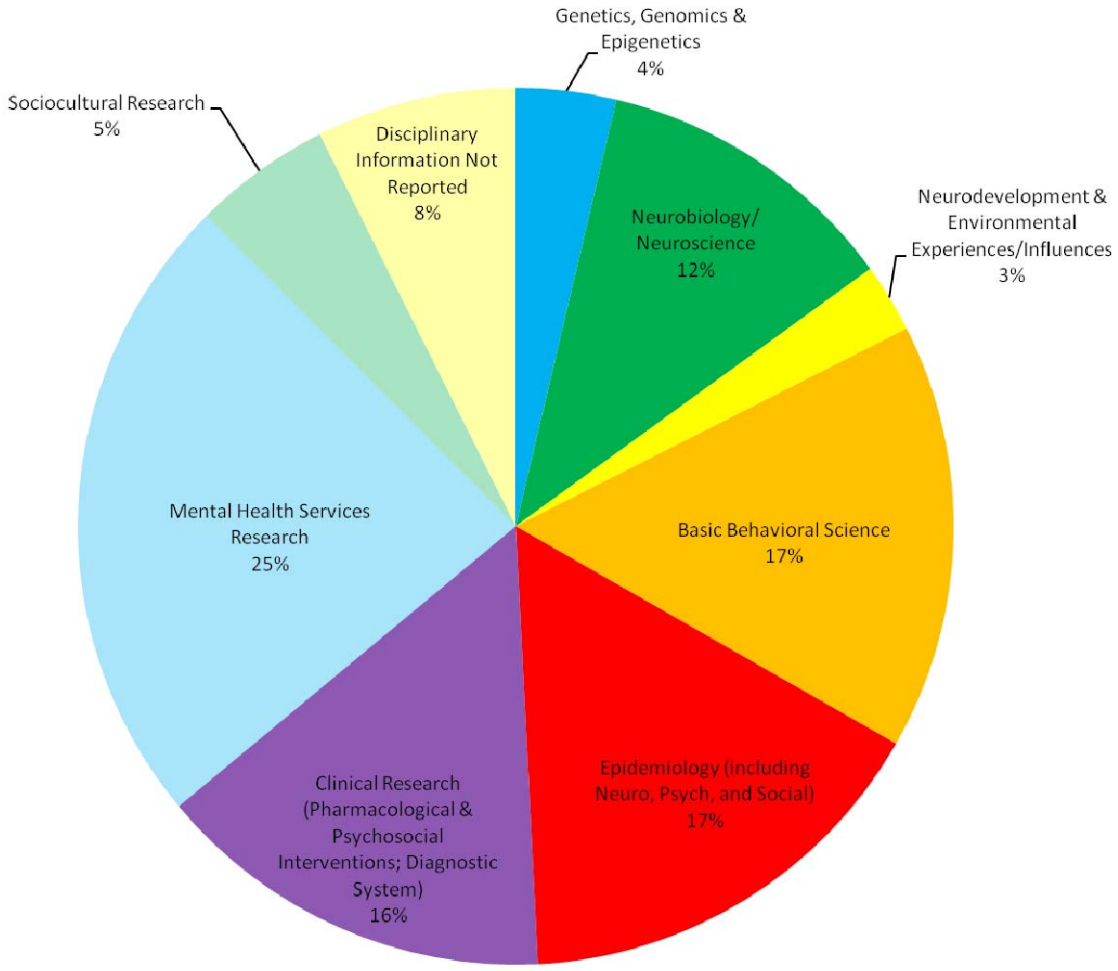
Supplementary Figure 1. Distribution of the Delphi Panel by Region of Work



Supplementary Figure 2. Distribution of the Delphi Panel by Region of Institutional/Organizational Affiliation



Supplementary Figure 3. Distribution of Delphi Panel by Discipline



SUPPLEMENTARY TABLES

Supplementary Table 1. Top 40 Challenges Selected by Delphi Panelists in Round 2

Rank	Challenge
1	Develop an evidence-based set of primary prevention interventions for a wide range of mental, neurological and substance use disorders.
2	Develop culturally-informed methods to eliminate the stigma, discrimination, and social exclusion of people with mental illness and their families across cultural settings.
3	Integrate core packages of mental health services into routine primary health care.
4	Establish cross-national evidence on the cultural, socioeconomic, and services factors underlying disparities in the incidence, diagnosis, treatment, and outcomes of mental, neurological and substance use disorders.
5	Train health professionals in low- and middle-income countries to provide evidence-based care for children with mental, neurologic, and substance use disorders.
6	Develop treatments for mental disorders for use by non-specialist health workers with minimal training.
7	Conduct screening for mental, neurological and substance use disorders during routine primary health care visits.
8	Develop valid, reliable definitions, models, and measurement tools for the quantitative assessment of mental, neurological and substance use disorders at the individual and population levels for use across cultures and settings.
9	Increase capacity in low- and middle-income countries by creating regional centers for mental health research, education, training and practice that incorporate the views and needs of local people.
10	Understand the impact of poverty, violence, civil conflict, and migration on mental, neurological and substance use disorders.
11	Reduce the cost and improve the supply of effective psychotropic drugs for mental, neurological and substance use disorders.
12	Establish shared, standardized global data systems for collecting surveillance data on the prevalence, treatment patterns, and availability of human resources and services for mental, neurological and substance use disorders.
13	Develop sustainable models to train and increase the number of culturally and ethnically diverse lay and specialist providers to deliver evidence-based services for mental, neurological and substance use disorders.
14	Provide adequate community-based care and rehabilitation for people with chronic mental illness.
15	Identify modifiable social and biological risk factors across the life course.
16	Strengthen the mental health component in the training of all health care personnel to create an equitable distribution of mental health providers.
17	Support community environments that promote physical and mental wellbeing across the life course.
18	Identify biomarkers for mental, neurological and substance use disorders.
19	Establish and implement minimum health care standards for mental, neurological, and substance use disorders around the world.
20	Redesign health systems to integrate mental, neurological and substance use disorders with

Rank	Challenge
	other chronic diseases.
21	Create parity between mental and physical illness in investment in research, training, treatment, and prevention.
22	Incorporate functional impairment and disability into assessment methods for mental, neurological and substance use disorders.
23	Develop mobile and IT technologies (e.g. telemedicine) to increase access to evidence-based care for mental, neurological and substance use disorders.
24	Develop locally appropriate strategies to eliminate childhood abuse and enhance child protection.
25	Incorporate a mental health component into international aid and development programs.
26	Develop interventions to reduce the long-term negative impact of low childhood socioeconomic status on cognitive ability and mental health.
27	Reduce the duration of untreated illness by developing culturally-sensitive early interventions for mental, neurological and substance use disorders across settings.
28	Enact a National Mental Health Plan for each country.
29	Foster resilience and enhance protective factors for mental, neurological and substance use disorders across developmental and life course stage.
30	Understand adaptive, normative, and resilient responses to daily life stress.
31	Develop methods to improve parenting skills and promote secure attachment with caregivers in infancy and childhood.
32	Enable family environments that promote physical and mental wellbeing across the life course.
33	Develop school-based mental health promotion programs for children and adolescents.
34	Involve people living with or affected by mental, neurological and substance use disorders in policy and practice development.
35	Improve access to evidence-based interventions (i.e. screening and treatment) for mental, neurological and substance use disorders in populations affected by conflict and displacement.
36	Create a standardized diagnostic system based on symptom severity and brain functioning that is applicable across cultures.
37	Integrate mental, neurological and substance use disorders into the chronic disease agenda at all levels of government.
38	Develop methods for predicting (pharmaceutical or psychosocial) treatment response and side effects.
39	Develop national child and adolescent mental health policies.
40	Promote awareness among researchers about the importance of cultural adaptation of interventions and development of context-appropriate concepts, instrumentation, and manuals.

Supplementary Table 2. Comparison of Overall Panel Rankings with Basic Scientist Panelists' Rankings of the Top 40 Challenges in Round 2

Rank	All Panelists' Rankings	Basic Scientist Panelists' Rankings
1	Develop an evidence-based set of primary prevention interventions for a wide range of mental, neurological and substance use disorders.	Develop an evidence-based set of primary prevention interventions for a wide range of mental, neurological and substance use disorders.
2	Develop culturally-informed methods to eliminate the stigma, discrimination, and social exclusion of people with mental illness and their families across cultural settings.	Develop valid, reliable definitions, models, and measurement tools for the quantitative assessment of mental, neurological and substance use disorders at the individual and population levels for use across cultures and settings.
3	Integrate core packages of mental health services into routine primary health care.	Develop culturally-informed methods to eliminate the stigma, discrimination, and social exclusion of people with mental illness and their families across cultural settings.
4	Establish cross-national evidence on the cultural, socioeconomic, and services factors underlying disparities in the incidence, diagnosis, treatment, and outcomes of mental, neurological and substance use disorders.	Identify biomarkers for mental, neurological and substance use disorders.
5	Train health professionals in low- and middle-income countries to provide evidence-based care for children with mental, neurologic, and substance use disorders.	Establish cross-national evidence on the cultural, socioeconomic, and services factors underlying disparities in the incidence, diagnosis, treatment, and outcomes of mental, neurological and substance use disorders.
6	Develop treatments for mental disorders for use by non-specialist health workers with minimal training.	Establish shared, standardized global data systems for collecting surveillance data on the prevalence, treatment patterns, and availability of human resources and services for mental, neurological and substance use disorders.
7	Conduct screening for mental, neurological and substance use disorders during routine primary health care visits.	Integrate core packages of mental health services into routine primary health care.
8	Develop valid, reliable definitions, models, and measurement tools for the quantitative assessment of mental, neurological	Conduct screening for mental, neurological and substance use

Rank	All Panelists' Rankings	Basic Scientist Panelists' Rankings
	and substance use disorders at the individual and population levels for use across cultures and settings.	disorders during routine primary health care visits.
9	Increase capacity in low- and middle-income countries by creating regional centers for mental health research, education, training and practice that incorporate the views and needs of local people.	Train health professionals in low- and middle-income countries to provide evidence-based care for children with mental, neurologic, and substance use disorders.
10	Understand the impact of poverty, violence, civil conflict, and migration on mental, neurological and substance use disorders.	Increase capacity in low- and middle-income countries by creating regional centers for mental health research, education, training and practice that incorporate the views and needs of local people.
11	Reduce the cost and improve the supply of effective psychotropic drugs for mental, neurological and substance use disorders.	Develop sustainable models to train and increase the number of culturally and ethnically diverse lay and specialist providers to deliver evidence-based services for mental, neurological and substance use disorders.
12	Establish shared, standardized global data systems for collecting surveillance data on the prevalence, treatment patterns, and availability of human resources and services for mental, neurological and substance use disorders.	Understand the impact of poverty, violence, civil conflict, and migration on mental, neurological and substance use disorders.
13	Develop sustainable models to train and increase the number of culturally and ethnically diverse lay and specialist providers to deliver evidence-based services for mental, neurological and substance use disorders.	Promote an integrated view of neuroscience that incorporates psychiatry, psychology and neurology.
14	Provide adequate community-based care and rehabilitation for people with chronic mental illness.	Develop treatments for mental disorders for use by non-specialist health workers with minimal training.
15	Identify modifiable social and biological risk factors across the life course.	Identify modifiable social and biological risk factors across the life course.
16	Strengthen the mental health component in the training of	Identify and validate true disease endophenotypes and their

Rank	All Panelists' Rankings	Basic Scientist Panelists' Rankings
	all health care personnel to create an equitable distribution of mental health providers.	cognitive, emotional, and behavioral consequences across geographic and cultural settings.
17	Support community environments that promote physical and mental wellbeing across the life course.	Create parity between mental and physical illness in investment in research, training, treatment, and prevention.
18	Identify biomarkers for mental, neurological and substance use disorders.	Understand adaptive, normative, and resilient responses to daily life stress.
19	Establish and implement minimum health care standards for mental, neurological, and substance use disorders around the world.	Provide adequate community-based care and rehabilitation for people with chronic mental illness.
20	Redesign health systems to integrate mental, neurological and substance use disorders with other chronic diseases.	Understand human brain development.
21	Create parity between mental and physical illness in investment in research, training, treatment, and prevention.	Apply genomics technologies to the study of disease causation and progression, treatment response, and gene-environment interactions in different settings.
22	Incorporate functional impairment and disability into assessment methods for mental, neurological and substance use disorders.	Reduce the cost and improve the supply of effective psychotropic drugs for mental, neurological and substance use disorders.
23	Develop mobile and IT technologies (e.g. telemedicine) to increase access to evidence-based care for mental, neurological and substance use disorders.	Establish and implement minimum health care standards for mental, neurological, and substance use disorders around the world.
24	Develop locally appropriate strategies to eliminate childhood abuse and enhance child protection.	Support community environments that promote physical and mental wellbeing across the life course.
25	Incorporate a mental health component into international aid and development programs.	Develop methods for predicting (pharmaceutical or psychosocial) treatment response and side effects.
26	Develop interventions to reduce the long-term negative impact of low childhood socioeconomic status on cognitive	Create a standardized diagnostic system based on symptom

Rank	All Panelists' Rankings	Basic Scientist Panelists' Rankings
	ability and mental health.	severity and brain functioning that is applicable across cultures.
27	Reduce the duration of untreated illness by developing culturally-sensitive early interventions for mental, neurological and substance use disorders across settings.	Foster resilience and enhance protective factors for mental, neurological and substance use disorders across developmental and life course stage.
28	Enact a National Mental Health Plan for each country.	Reduce the duration of untreated illness by developing culturally-sensitive early interventions for mental, neurological and substance use disorders across settings.
29	Foster resilience and enhance protective factors for mental, neurological and substance use disorders across developmental and life course stage.	Strengthen the mental health component in the training of all health care personnel to create an equitable distribution of mental health providers.
30	Understand adaptive, normative, and resilient responses to daily life stress.	Develop interventions to reduce the long-term negative impact of low childhood socioeconomic status on cognitive ability and mental health.
31	Develop methods to improve parenting skills and promote secure attachment with caregivers in infancy and childhood.	Develop national child and adolescent mental health policies.
32	Enable family environments that promote physical and mental wellbeing across the life course.	Redesign health systems to integrate mental, neurological and substance use disorders with other chronic diseases.
33	Develop school-based mental health promotion programs for children and adolescents.	Develop mobile and IT technologies (e.g. telemedicine) to increase access to evidence-based care for mental, neurological and substance use disorders.
34	Involve people living with or affected by mental, neurological and substance use disorders in policy and practice development.	Develop methods to improve parenting skills and promote secure attachment with caregivers in infancy and childhood.
35	Improve access to evidence-based interventions (i.e. screening and treatment) for mental, neurological and substance use disorders in populations affected by conflict	Develop new fast-acting drugs with minimal side effects for mental, neurological and substance use disorders.

Rank	All Panelists' Rankings	Basic Scientist Panelists' Rankings
	and displacement.	
36	Create a standardized diagnostic system based on symptom severity and brain functioning that is applicable across cultures.	Enact a National Mental Health Plan for each country.
37	Integrate mental, neurological and substance use disorders into the chronic disease agenda at all levels of government.	Determine the role of neural mechanisms in mental, neurological and substance use disorders.
38	Develop methods for predicting (pharmaceutical or psychosocial) treatment response and side effects.	Promote awareness of modifiable risk factors for and manifestations of mental, neurological and substance use disorders across the life course to increase prevention, diagnosis, treatment, and help seeking.
39	Develop national child and adolescent mental health policies.	Raise awareness among health professionals and health workers about the burden of and effective interventions for mental, neurological and substance use disorders at the population level.
40	Promote awareness among researchers about the importance of cultural adaptation of interventions and development of context-appropriate concepts, instrumentation, and manuals.	Develop school-based mental health promotion programs for children and adolescents.

NOTE. Challenges in red text indicate priorities selected by the overall group that were not selected as priorities by the basic scientists. Challenges in green text denote the priorities selected by the basic scientists that were not selected by the overall group.

Supplementary Table 3. Overall Ranking Across All Criteria in Round 3

Round 2 Rank	Challenge	Round 3 Score
3	Integrate core packages of mental health services into routine primary health care.	2.375
11	Reduce the cost and improve the supply of effective psychotropic drugs for mental, neurological and substance use disorders.	2.343
5	Train health professionals in low- and middle-income countries to provide evidence-based care for children with mental, neurologic, and substance use disorders.	2.294
14	Provide adequate community-based care and rehabilitation for people with chronic mental illness.	2.247
16	Strengthen the mental health component in the training of all health care personnel to create an equitable distribution of mental health providers.	2.134
25	Incorporate a mental health component into international aid and development programs.	2.127
6	Develop treatments for mental disorders for use by non-specialist health workers with minimal training.	2.124
33	Develop school-based mental health promotion programs for children and adolescents.	2.097
13	Develop sustainable models to train and increase the number of culturally and ethnically diverse lay and specialist providers to deliver evidence-based services for mental, neurological and substance use disorders.	2.094
35	Improve access to evidence-based interventions (i.e. screening and treatment) for mental, neurological and substance use disorders in populations affected by conflict and displacement.	2.076
1	Develop an evidence-based set of primary prevention interventions for a wide range of mental, neurological and substance use disorders.	2.074
37	Integrate mental, neurological and substance use disorders into the chronic disease agenda at all levels of government.	2.073
27	Reduce the duration of untreated illness by developing culturally-sensitive early interventions for mental, neurological and substance use disorders across settings.	2.061
21	Create parity between mental and physical illness in investment in research, training, treatment, and prevention.	2.050
7	Conduct screening for mental, neurological and substance use disorders during routine primary health care visits.	2.042
24	Develop locally appropriate strategies to eliminate childhood abuse and enhance child protection.	2.007
2	Develop culturally-informed methods to eliminate the stigma, discrimination, and social exclusion of people with mental illness and their families across cultural settings.	1.996
9	Increase capacity in low- and middle-income countries by creating regional centers for mental health research, education, training and practice that incorporate the views and needs of local people.	1.966
23	Develop mobile and IT technologies (e.g. telemedicine) to increase access to evidence-based care for mental, neurological and substance use disorders.	1.965
19	Establish and implement minimum health care standards for mental, neurological, and substance use disorders around the world.	1.945
39	Develop national child and adolescent mental health policies.	1.918
20	Redesign health systems to integrate mental, neurological and substance use disorders with other chronic diseases.	1.909

Round 2 Rank	Challenge	Round 3 Score
31	Develop methods to improve parenting skills and promote secure attachment with caregivers in infancy and childhood.	1.905
28	Enact a National Mental Health Plan for each country.	1.890
26	Develop interventions to reduce the long-term negative impact of low childhood socioeconomic status on cognitive ability and mental health.	1.883
17	Support community environments that promote physical and mental wellbeing across the life course.	1.800
34	Involve people living with or affected by mental, neurological and substance use disorders in policy and practice development.	1.797
22	Incorporate functional impairment and disability into assessment methods for mental, neurological and substance use disorders.	1.783
32	Enable family environments that promote physical and mental wellbeing across the life course.	1.767
40	Promote awareness among researchers about the importance of cultural adaptation of interventions and development of context-appropriate concepts, instrumentation, and manuals.	1.760
4	Establish cross-national evidence on the cultural, socioeconomic, and services factors underlying disparities in the incidence, diagnosis, treatment, and outcomes of mental, neurological and substance use disorders.	1.682
29	Foster resilience and enhance protective factors for mental, neurological and substance use disorders across developmental and life course stage.	1.680
15	Identify modifiable social and biological risk factors across the life course.	1.656
38	Develop methods for predicting (pharmaceutical or psychosocial) treatment response and side effects.	1.651
12	Establish shared, standardized global data systems for collecting surveillance data on the prevalence, treatment patterns, and availability of human resources and services for mental, neurological and substance use disorders.	1.639
10	Understand the impact of poverty, violence, civil conflict, and migration on mental, neurological and substance use disorders.	1.628
8	Develop valid, reliable definitions, models, and measurement tools for the quantitative assessment of mental, neurological and substance use disorders at the individual and population levels for use across cultures and settings.	1.626
30	Understand adaptive, normative, and resilient responses to daily life stress.	1.463
36	Create a standardized diagnostic system based on symptom severity and brain functioning that is applicable across cultures.	1.431
18	Identify biomarkers for mental, neurological and substance use disorders.	1.351

SUPPLEMENTARY NOTES
Concept Note to Potential Delphi Panelists

GRAND CHALLENGES IN GLOBAL MENTAL HEALTH

What is a 'Grand Challenge'?

A 'grand challenge' is a specific barrier that, if removed, would help to solve an important health problem. The intervention(s) it could lead to, if successfully implemented, would have a high likelihood of feasibility for scaling up and impact.[i]

Background and Rationale

More than 100 years ago, mathematician David Hilbert formulated a list of important unsolved problems; Hilbert's list of 23 challenges has spurred innovation in mathematics research ever since. Recognizing the importance of collective action for overcoming scientific hurdles, the global health community embraced this methodology for improving the lives of its global constituency. In 2003, the Grand Challenges in Global Health project promoted the discovery and development of new tools to fight infectious diseases that cause millions of deaths each year in developing countries.[ii] In 2007, the Grand Challenges in Chronic Non-communicable Diseases study addressed non-communicable disorders (excluding mental health), which have reached epidemic proportions in both the developed and developing worlds.[iii] Both of these initiatives led to the commitment of significant new programs of funding from the Bill and Melinda Gates Foundation, the Wellcome Trust and the Canadian Institutes of Health Research; and from the Global Alliance for Chronic Disease, respectively.

Now, in 2010, it is time to focus our collective efforts on global mental health.

The World Health Organization's (WHO) ongoing Global Burden of Disease Study identifies neuropsychiatric disorders as substantial sources of disease burden. Thirteen percent of the total global burden of disease is due to neuropsychiatric disorders; similarly, these disorders account for a significant proportion of the burden from non-communicable diseases (which account for a proportion of the global disease burden as large as communicable diseases, maternal and perinatal illnesses combined).[iv]

Disease burden is not the only factor that renders neuropsychiatric disorders a high-priority topic, however. Across the world, the treatment gaps for neuropsychiatric disorders are large and lead to chronic disabilities and increased mortality. People living with neuropsychiatric disorders often face systematic discrimination in diverse domains of their lives. Despite the suffering and disability they cause, relatively few resources are allocated worldwide to fund the necessary research to effectively prevent and treat neuropsychiatric disorders.

In order to assist in targeting the limited resources for action, recent priority setting exercises have proposed research strategies in global mental health. The Lancet Global Mental Health Series identified gaps in the

evidence base for depressive disorders, alcohol and substance-use disorders, child and adolescent mental disorders, and psychotic disorders with a focus on closing the treatment gaps in developing countries. The results of the *Lancet* group's priority-setting exercise suggested a prioritization of implementation science questions, for example health policy and systems research, research on affordable delivery of cost-effective interventions, and epidemiological research on childhood disorders and substance use disorders.[v] The WHO and the Global Forum for Health Research assessed priorities for research in low- and middle-income countries.[vi, vii] These exercises also reported that epidemiology, health systems and social science research were ranked as top priorities.

The Grand Challenges in Global Mental Health Initiative seeks to build on these exercises to identify what stands between where we are now and where we want to be, ideally—the grand challenges. Identifying these challenges will help us ascertain the major scientific thrusts that will be needed to make a significant impact on the lives of people living with neuropsychiatric disorders worldwide. It differs from the preceding exercises in several distinct ways. First, its scope is global in perspective and it addresses a wide range of disorders that affect the nervous system. Second, the consultation process involves a wider community of stakeholders. Third, it is explicitly linked to the support of a community of funders. (Each is discussed in further detail below.)

Objective

The Grand Challenges in Global Mental Health Initiative provides the critical opportunity to bring neuropsychiatric disorders to the forefront of global attention and scientific inquiry. The goal of the Initiative is to identify the grand challenges (as defined above), and in so doing pinpoint research priorities that, within the next decade, can lead to substantial improvements in the lives of people living with neuropsychiatric illnesses.

What encompasses 'Mental Health'?

For the purposes of this Initiative, the definition of 'mental health' includes all conditions that affect the nervous system that are leading causes of disease burden, estimated on the basis of disability adjusted life years (DALYs). Conditions with a vascular or infectious etiology are excluded as these would have been addressed through the previous Grand Challenges initiatives. Our selection further ensures that conditions that are leading causes of disease burden in one gender or specific age groups are also included. Based on the most recent Global Burden of Disease report,[viii] among the health conditions that are included within our remit are: depression, anxiety disorders, schizophrenia, bipolar disorders, alcohol and drug use disorders, mental disorders of childhood, migraines, dementias, and epilepsy. Thus, the list of health conditions includes disorders which clinicians may categorize as psychiatric, neurological or substance use disorders.

What does 'Global' mean?

The term 'global' mental health encompasses mental health in any country of the world. A core focus in global mental health is related to both reducing the overall burden of health conditions (*i.e.,* effectiveness) and reducing and–ultimately–eliminating health inequalities within and between countries. In addition, the term 'global' refers to global influences on mental health, *e.g.* cross-national factors such as climate change or macroeconomic policies. The responsibility for improving global mental health transcends national borders, class, race, gender, ethnicity and culture; its promotion requires collective action based on global partnerships.

Methodology

The methodology is an adaptation of the Delphi method used for the Grand Challenges in Chronic Non-communicable Diseases study. A Delphi Panel consisting of approximately 400 stakeholders will be repeatedly surveyed. Panel members are selected to provide a representation of the diverse clinical, policy, advocacy, user and research communities whose interests are covered within the Initiative's scope of "global

mental health."

Specifically, the Initiative's adapted Delphi method consists of the following major steps:

1. The Scientific Advisory Board establishes the scope and question for the Initiative.
2. The Scientific Advisory Board guides the selection of a broad and representative Delphi Panel.
3. Round 1: Each member of the Delphi Panel submits his or her suggestions in response to the Grand Challenges question. *Mid-April.*
4. The administration team qualitatively synthesizes the Round 1 responses.
5. Round 2: Each member of the Delphi Panel selects his or her top 30 questions from the longer list of Grand Challenges identified in and synthesized following Round 1. *Mid-July.*
6. The administration team compiles a consolidated list of the top 30 Grand Challenges from Delphi Panelists' selections.
7. Round 3: Each member of the Delphi Panel rates the consolidated list of 30 Grand Challenges on various dimensions (*e.g.*, feasibility, likely impact, etc.); *Mid-September*.
8. The administration team analyzes the results and presents them in summary form to the Scientific Advisory Board for interpretation.

The Delphi method's structured, sequential questioning with controlled feedback is ideal for attaining the goals of this Initiative: distilling knowledge and building reliable consensus.

Management

The Grand Challenges in Global Mental Health Initiative is led by the U.S. National Institute of Mental Health (NIMH) and the Global Alliance for Chronic Disease (GACD), in partnership with the Wellcome Trust, the McLaughlin-Rotman Centre for Global Health, and the London School of Hygiene and Tropical Medicine (LSHTM). Two discrete bodies are responsible for the stewardship of the project: the Executive Committee and the Scientific Advisory Board.

The Executive Committee is in charge of broad oversight and funding of the Grand Challenges. Its membership comprises leaders of key funding agencies and members of the board of directors of the Global Alliance for Chronic Disease. The Executive Committee is co-chaired by Prof. Abdallah Daar (Chair, GACD Board of Directors; and University of Toronto, Canada) and Dr. Thomas R. Insel (Director, NIMH, USA).

The Scientific Advisory Board is in charge of guiding the overall scientific process, including: selection of members for the Delphi Panel; questionnaire development; data synthesis; and reporting of results. The Scientific Advisory Board is co-chaired by Prof. Vikram Patel (Professor of International Mental Health and Wellcome Trust Senior Research Fellow, LSHTM, UK; and Sangath, India) and Dr. Pamela Collins (Director, Office for Research on Disparities and Global Mental Health, NIMH, USA). Leaders in the scientific disciplines relevant to neuropsychiatric disorders have been nominated to the Board for their singular contributions to relevant research themes and disciplines and to diverse global regions.

The day-to-day functioning of the Grand Challenges in Global Mental Health Initiative will be coordinated from NIMH and supported by a dedicated team of administrators.

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[i] Daar, A. S., Singer, P. A., Persad, D. L., Pramming, S. K., Matthews, D. R., Beaglehole, R., . . . Bell, J. (2007). Grand challenges in chronic non-communicable diseases. *Nature, 450,* 494-496.

[ii] Varmus, H., Klausner, R., Zerhouni, E., Acharya, T. Daar, A. S., & Singer, P. A. (2003). Grand challenges in global health. *Science, 302,* 398-399.

[iii] Daar, A. S., Singer, P. A., Persad, D. L., Pramming, S. K., Matthews, D. R., Beaglehole, R., . . . Bell, J. (2007). Grand challenges in chronic non-communicable diseases. *Nature, 450,* 494-496.

[iv] World Health Organization. (2005). World Health Organization preventing chronic diseases: A vital investment.
[v] Lancet Global Mental Health Group. (2007). Scale up services for mental disorders: A call for action. *Lancet, 370, 1241-1252.*
[vi] Tomlinson, M., Rudan, I., Saxena, S., Swartz, L., Tsai, A. C., & Patel, V. (2009). Priorities for global mental health research. *Bulletin of the World Health Organization, 87,* 438-446.
[vii] Sharan, P., Gallo, C., Gureje, O., Lamberte, E., Mari, J. J., Mazzotti, G., . . . Saxena, S. (2009). Mental health research priorities in low- and middle-income countries of Africa, Asia, Latin America and the Caribbean. *British Journal of Psychiatry, 295,* 354-363.
[viii] World Health Organization. (2008). The global burden of disease: 2004 update.